# Tailings Dam Tool

**Overview**

In this tutorial, the tailings dam tool is used to create a tailings dam hydrograph and simulate a tailings dam failure. The Tailings Dam Tool estimates the tailings release volume. The tool was developed based on site and historical information. It predicts the potential for tailings dam failure occurrence and allows the user to select a discharge and mudflow concentration hydrograph.

**Required data**

This step makes use of the Tailings Dam Tool. The required data is available here:

C:\Users\Public\Documents\FLO-2D PRO Documentation\Example Projects\ Tailings Dam Breach Workshop\

|  |  |  |
| --- | --- | --- |
| File | Content | Location |
| Tailings Dam Breach.exe | Tailings Dam Tool | Program Files (x86)/FLO-2D Pro |

## Step 1: Select the inflow node

1. Zoom into the Tailings Dam area and select the Grid Element where the inflow will be added. The pre-failure aerial shows the dam intact.
2. This image was screen captured from Google Earth Historical view and aligned to the map using a plugin called Freehand raster georeferencer.

A map of a forest

Description automatically generated

1. Use the Grid Info Tool to find the Grid Element ID.

A screenshot of a computer

Description automatically generated

This Grid Element will be used as the inflow point from the output of the Tailings Dam Tool. It is recommended to select a Grid Element located where the Dam Breach is most likely to happen.

1. Write down the Grid Element ID because it will be required in the following steps.

## Step 2: Run the Tailings Dam Tool

1. Open the Tailings Dam Tool by clicking on the dropdown menu and clicking on Tailings Dam Tool.

A screenshot of a computer

Description automatically generated A river flowing through a quarry

Description automatically generated with medium confidence

1. Start with selecting the Metric system on Options.

A screenshot of a computer

Description automatically generated

1. Fill out the Tailings Dam parameters as follows:

A screenshot of a computer

Description automatically generated

1. Move the cursor over the dialog boxes the view a descriptive comment and/or click on the question mark on bottom left to visualize the physical meaning of each parameter.

A diagram of a soil layer

Description automatically generated

1. On the next page, choose the Static Mode, set the Reservoir Level to Medium, and the Pore Pressure to high. Click on Create INFLOW.DAT.

A screenshot of a computer

Description automatically generated

These equations result in volumes (Vr) that represent a percentage of the storage volume (Vi).

* Vi = 7,500,000 m3
* Vrmin = 4.2% Vi
* Vrmax = 82% Vi
* Vraverage = 14.5% Vi
* Larrauri and Lall = 34% Vi
* Rico = 41% Vi
* Piciullo updated eq = 41% Vi
* Actual failed Feijao release = 71% Vi

Refer to the PowerPoint presentation to see the source of the equations.

1. On the save INFLOW.DAT window, select the Vrmax. Change the event time to 0.20 hours. This variable is highly sensitive to the early hazard zone. The report states that in 10 min 75% of the reservoir was drained. Set the Grid Cell as the Grid Element ID found in the previous steps. Select the graph shown in the picture below.

A screenshot of a computer screen

Description automatically generated

1. Click on the Sediment Concentration by Volume tab. Select the graph shown in the picture below.

A screenshot of a computer

Description automatically generated

1. Double check if the Peak Discharge and Hydrograph Sediment Volume are within the expected ranges.
2. Click on Save INFLOW.DAT and set the export folder to Export Tailings Dam Tool.
3. Click on Back to close the Save INFLOW.DAT window.
4. Save the Tailings Breach.xml file to the data file in the Tailings Dam Tool folder and Exit the Tailings Dam Tool

A screenshot of a computer

Description automatically generated

## Step 3: Mudflow parameters

1. Open the mudflow tool.



1. Select the Mudflow Tab and fill the form and save the parameters.

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Description automatically generated

For more information on mudflow modeling, see the Mudflow Modeling Guidelines: "C:\Users\Public\Documents\FLO-2D PRO Documentation\flo\_help\Manuals\Simulating Mudflow Guidelines.pdf"

## Step 4: Review the control variables

1. On QGIS, open the control variables, adjust the time Control and Plot Variables.

A screenshot of a computer

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Description automatically generated

1. Uncheck the Rainfall and Infiltration Physical Processes Switches.

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Description automatically generated

In this and on the forthcoming lessons, the Rainfall and Infiltration processes will not be activated as this is a sunny day failure.

1. Save the Control Variables and the Project.

A screenshot of a computer

Description automatically generated

1. Click the FLO-2D Data Export icon, select the Export Tailings Dam Tool folder.



1. Uncheck the Rain and Infiltration and click OK.

**A screenshot of a computer

Description automatically generated**

The INFLOW.DAT file is already on the export folder because it was created using the Tailings Dam Tool. That’s why there is no Inflow Elements switch on the FLO-2D Data Export.

## Step 5: Run the simulation

1. Click on the Run FLO-2D icon to run the simulation.

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Description automatically generated

1. Close the warning.

A screenshot of a error message

Description automatically generated

This warning shows that the peak discharge is high, leading to a probable slow simulation. This happens because there is a high inflow into a single Grid Element. It is a good practice to split the inflow hydrograph into several grid element.

1. Check the simulation output information.

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Description automatically generated

## Step 6: Load new results

1. Open the FLO-2D Rasterizor plugin.

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Description automatically generated

1. Select the FINALDEP.OUT file in the Export Tailings Dam folder. Set the Name the layer Final Depth TDT, select the Output Directory as the Export Tailings Dam folder and select Depth as style.
2. Run FLO-2D Rasterizor and close. Check the results.

A screenshot of a computer

Description automatically generated A map of land with a person in the middle

Description automatically generated

1. Check the volume in Summary.out

A white rectangular object with black text

Description automatically generated

## Step 7: Organize the map layers

1. Group the external data, results, elevation, and aerials so that data is not lost when performing imports.

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